

Tier 2 Sampling 101

Tier 2 Landfill Gas Sampling at Class I Landfills



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Presenter:

Matthew S. Lamb

What is a “Tier 2”?

- ▶ Site Specific NMOC Concentration (C_{NMOC}) Determination Method
- ▶ Calculation of Non-Methane Organic Compound (NMOC) Emissions
- ▶ Determines when Landfill Gas Collection/Control System (LFGCCS) is required
- ▶ Method 25C

Regulatory Requirements

- ▶ Title V Permitted NSPS Sites ($>2.5\text{MM Mg/m}^3$)
 - Subpart WWW
 - NMOC Emissions **50 Megagrams/year** or more (§ 60.754)
 - Subpart XXX
 - NMOC Emissions **34 Megagrams/year** or more (§ 60.764)
- ▶ Tier 1 default value of 4,000 parts per million
- ▶ “Typical” Tier 2 results range from 400 to 800 ppm
- ▶ Possible NMOC emission reductions of 80-90%

Test Protocol Preparation

- ▶ Tier 2 Report due within 180 days after Tier 1
 - Allow time for protocol approval, sample collection, lab analysis
- ▶ Typical Elements of the Protocol (§ 60.8)
 - Facility description, sample locations
 - Sample density/distribution. 2 sample points per hectare, up to 50 sample points (§ 60.754, § 60.764)
 - Composite or not?
 - Test methods (3C/25C), lab certifications
 - QA/QC measures, field data collected
 - Alternative test methods/variance requests

Additional Notification/Coordination

- ▶ Permitting agency reviews the protocol
- ▶ 45 day review in some states
- ▶ 15 day minimum notification to field office prior to sampling
- ▶ Coordinate with facility manager
 - Operating hours
 - Use of field equipment
 - Visit site ahead of time, if possible

Before You Sample

- ▶ Coordinate with Lab
 - Cost per sample (Methods 3C & 25C)
 - Turnaround time, costs for accelerated TAT
 - Rental costs (*Canisters, Flow meters, Flow controller*)
- ▶ Schedule Geoprobe, if needed
- ▶ Program IDs into field meter
- ▶ Prepare sample log
- ▶ Double check with agency to ensure inspector is available to observe
- ▶ Charge & Field Calibrate Meters!!!

When you Arrive On-Site

- ▶ Check in with Facility Manager
- ▶ Pre-Sampling Meeting
 - Include Manager, Inspector, others involved in sampling
 - Safety
 - *Areas to avoid*
 - *PPE requirements*
 - Assistance needed from site to perform sampling
 - Go over sample points on drawing
 - Schedule which points to sample first

Where to Test

“install at least two sample probes per hectare of landfill surface that has retained waste for at least 2 years” (§ 60.754, § 60.764)

- ▶ Two (2) sample points per hectare
- ▶ Up to 50 sample points TOTAL
- ▶ Demonstrate even distribution
- ▶ Avoid sampling waste less than 2 years old
 - Move to side slopes
 - Sample from vents or cleanouts if available

Where to Test: Vents



Where to Test: Leachate Cleanouts

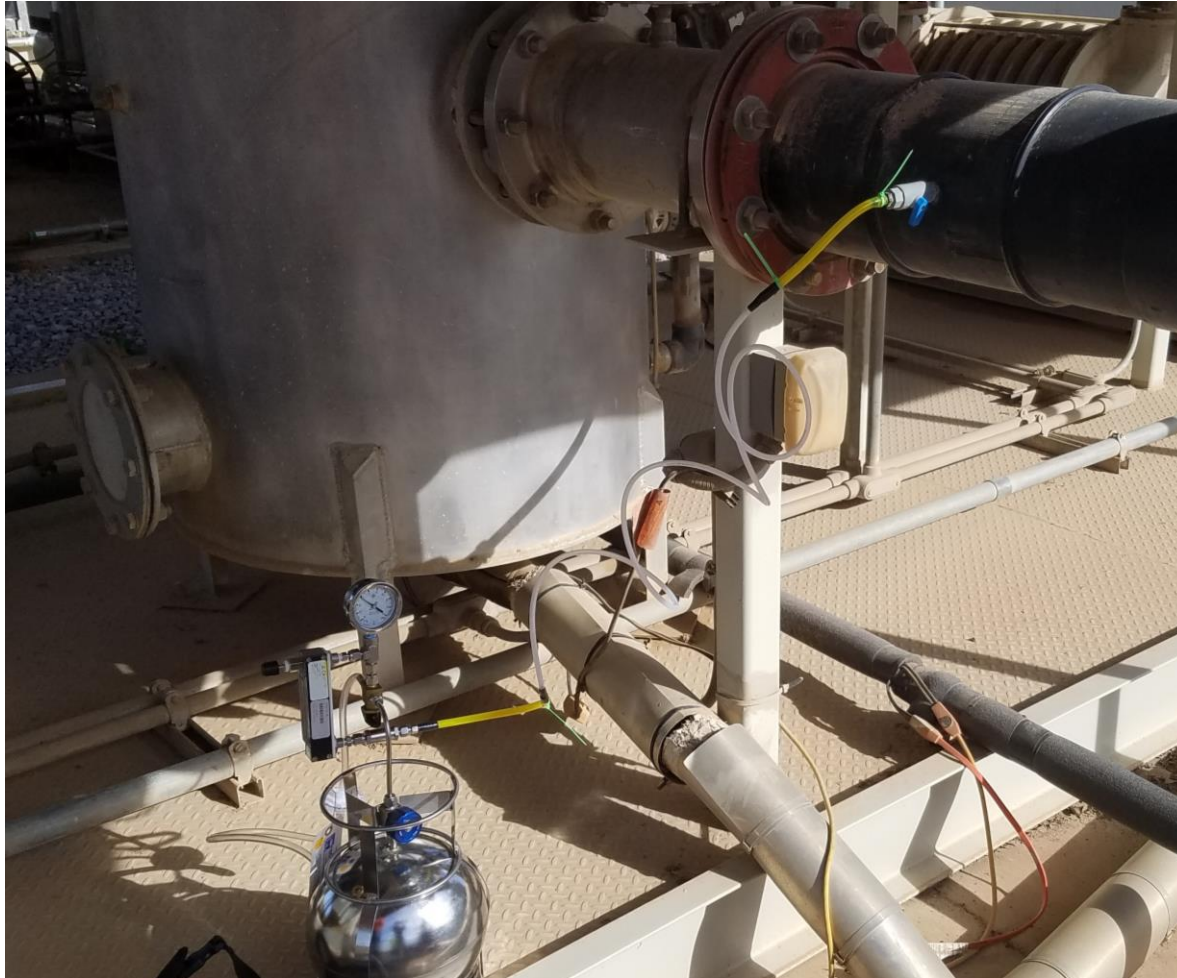


Where to Test: Push Probe/Geoprobe



Where to Test: LFG Header to Flare

*Three (3) separate canisters **BEFORE** knockout pot and blower*



Additional Points May be Needed

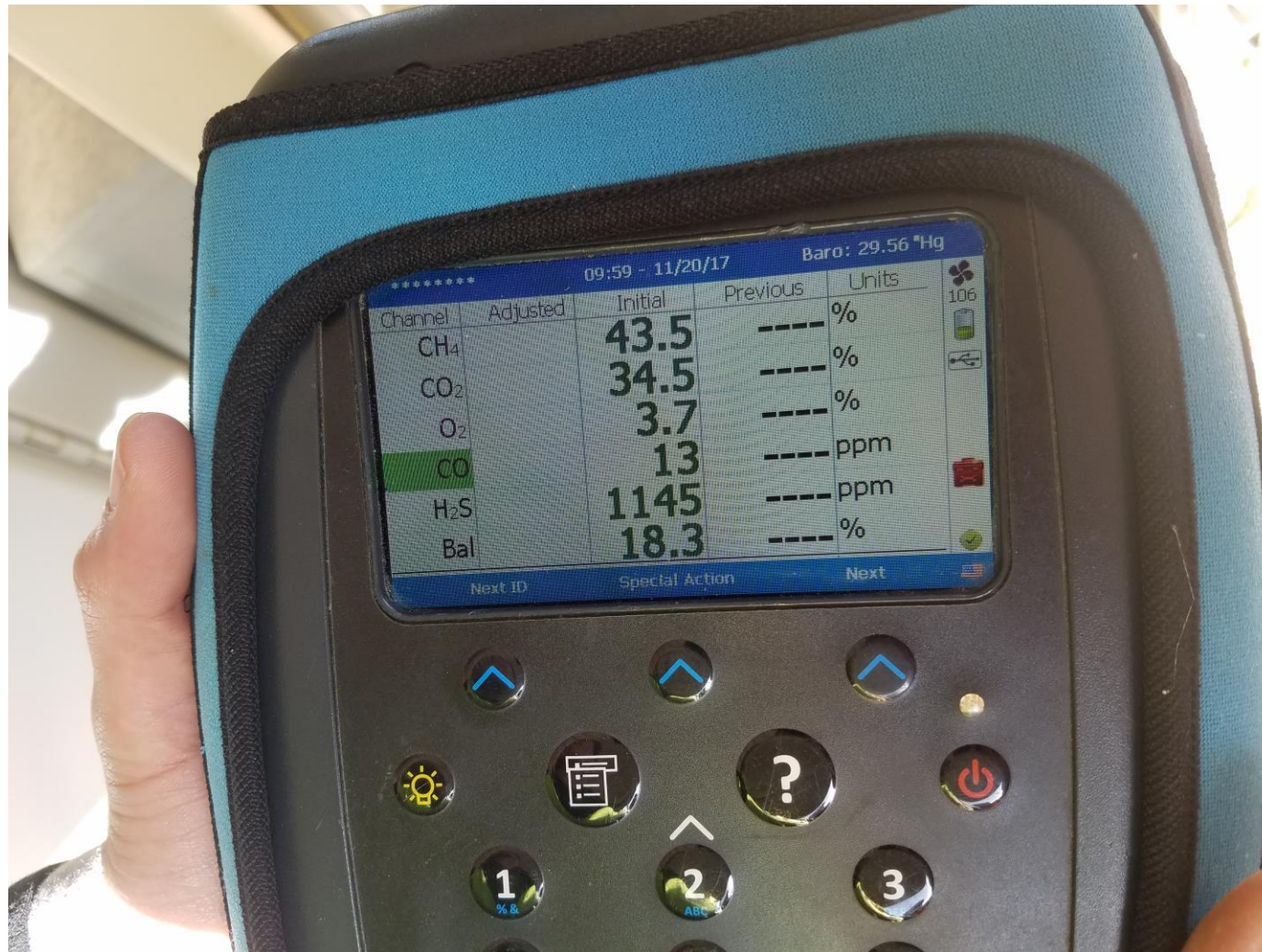
- ▶ Qualifying samples must have:
 - Oxygen less than 5%, and
 - Balance gas less than 20%
 - Determined by Lab using Method 3C
 - Field meter can give indication
- ▶ Agency inspector should be consulted to approve alternate sample point(s)

Data to Collect at the Sample Location

▶ Field meter data

- Sample location ID
- LFG content (CH_4 , CO_2 , O_2 , Balance Gas)
- Ambient temperature and pressure at each sample point

Field Meter Data

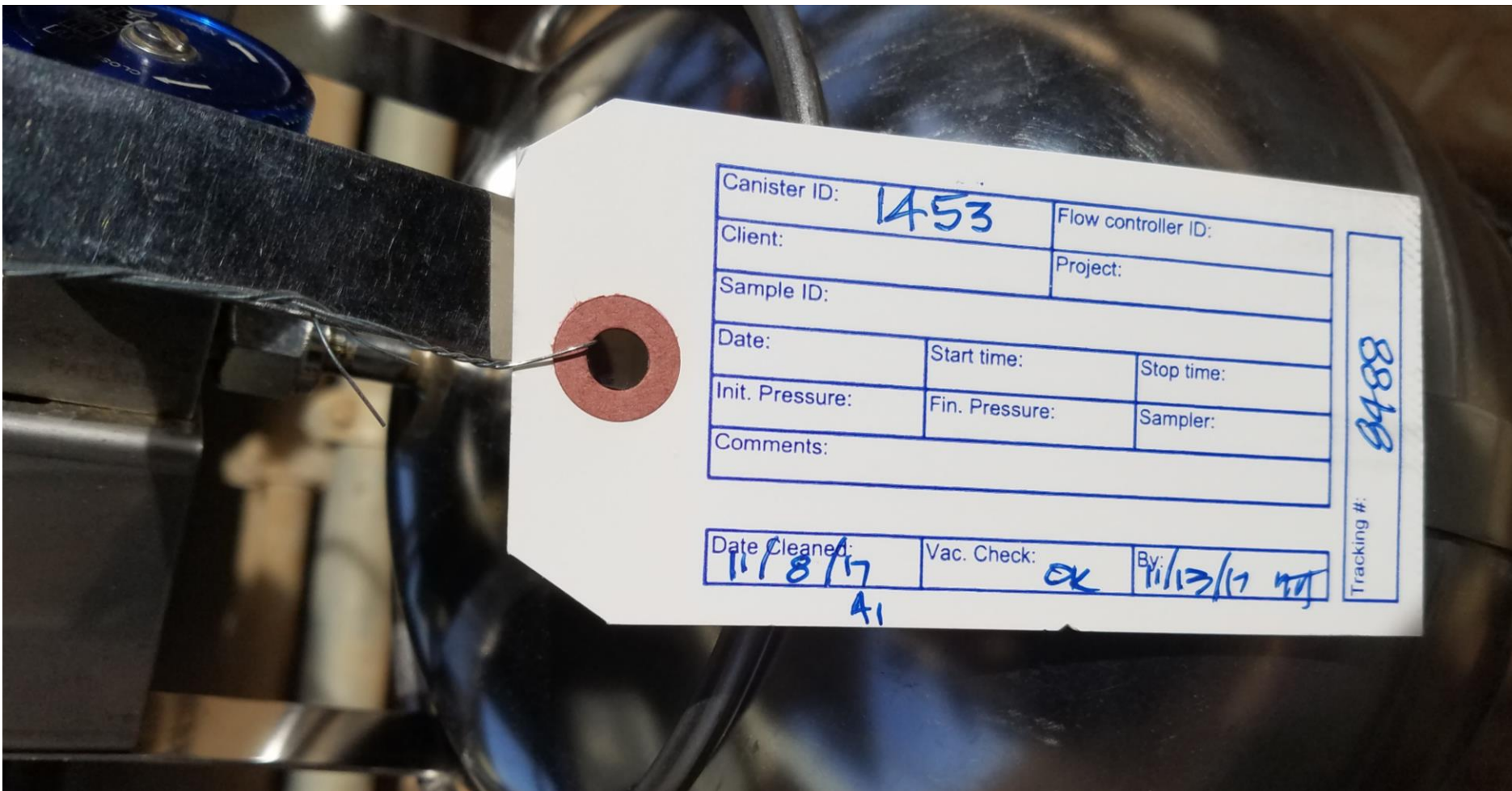


Data to Collect at the Sample Location

▶ Sample canister data

- Canister ID, sample point ID, sample no.
- Vacuum before and after sample collection
- IF compositing samples, record flow rate (<500ml/min)

Sample Canister Data



Canister ID: 1453		Flow controller ID:
Client:		Project:
Sample ID:		
Date:	Start time:	Stop time:
Init. Pressure:	Fin. Pressure:	Sampler:
Comments:		
Date Cleaned: 11/8/17 41	Vac. Check: OK	By: 11/13/17 [signature]

Tracking #: 9488

Sample Canister Data

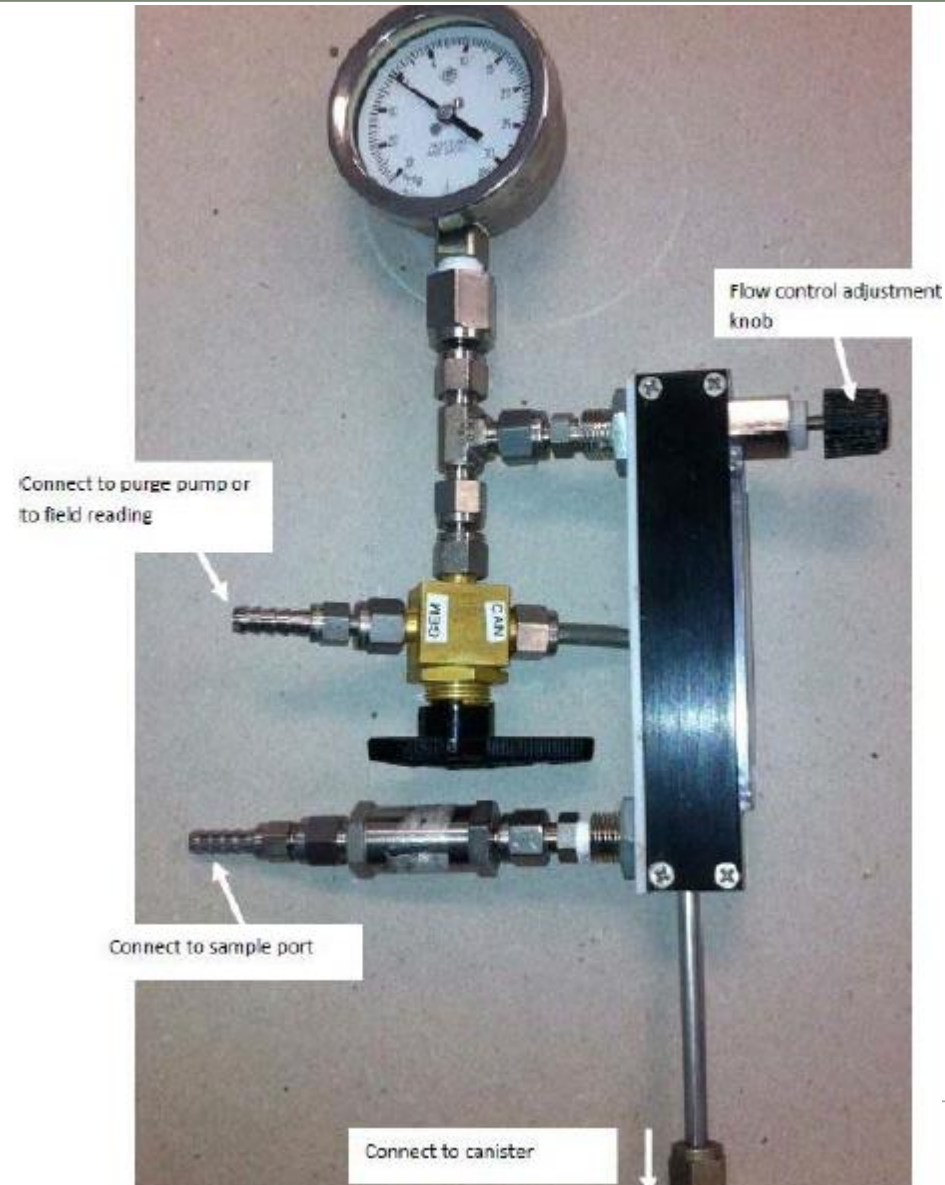


How to Collect Samples

▶ Assemble sample train

- Leak check and purge two (2) volumes of sample probe
 - *1" diameter 7' probe at 500ml/min = ~5 minutes*
 - *2" diameter 7' probe at 500ml/min = ~20 minutes*
- Purging vents or cleanouts is not required by the method
- Method 25C only references “probes” when discussing purging
- Purging vents or cleanouts would take hours, and is not practical

How to Collect Samples: Check ALL Valves



How to Collect Samples: Compositing

- ▶ Rule allows collecting composite samples from multiple points into one (1) canister
 - Limit to maximum of three (3) separate points per can
 - Equal volume from each sample point (1 liter minimum)
Measure flow rate and record start/stop pressures
 - Avoid composite sampling across separate units

QA/QC Procedures

- ▶ Document all field readings on a sample log

Tier 2 Field Sample Log

PROJECT _____
SUBJECT _____

SHEET _____
JOB # _____
DATE _____
SAMPLED BY _____

Tank No.	Sample No.	Pre-Test Field Results			Tank Sampling Record						Post-Test Field Results		
					Start Time				Stop Time				
		CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Ambient Pressure*	Ambient Temp [°F]	Pressure [in. Hg]	Flow Rate [L/min]	Pressure [in. Hg]	Flow Rate [L/min]	CH ₄ (%)	CO ₂ (%)	O ₂ (%)

*For composite samples use a separate row to record field readings for each sample location.
**Specify units
Comments:

QA/QC Procedures

- ▶ Purging sample train of ambient air
- ▶ Filter trap to remove free liquid/condensate
- ▶ Request “full” (Level 4) lab report
 - GC run printouts
 - Lab leak check results
 - As left/as found canister vacuum

Preparing for Shipping

- ▶ Fill out the chain of custody

TECHNOLOGY
Laboratories, Inc.

18501 E. Gale Ave., Suite 130
City of Industry, CA 91748
Ph: 626-964-4032
Fx: 626-964-5832

Project No.:

Project Name:

Report To:

Company:

Street:

City/State/Zip:

Phone& Fax:

e-mail:

LAB USE ONLY

SAMPLE IDENTIFICATION

[illegible]

AUTHORIZATION TO PERFORM WORK

Mat Jank

SAMPLED BY
Matt Lamb

RELINQUISHED BY

ELINQUISHED BY

COMPANY

Gardner, Inc.

COMPANY

10

1-30 RECEIVED BY

120

RECEIVED BY

RECEIVED BY

DATE/TIME

120/17

DATE/TIME

DATE/TIME

ED. A. STEIN, *Editor*

DATE/TIME

DATE/TIME

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DATE/TIME

COMMENTS

METHOD OF TRANSPORT (circle one): Walk-In FedEx UPS Courier ATLI Other

DISTRIBUTION: White & Yellow - Lab Copies / Pink - Customer Copy

Preservation: H=HCL N=None / Container: B=Bag C=Can V=VOA O=Other

Preparing for Shipping

- ▶ Ensure cans are not dangerous goods (DOT/IATA)
 - Request “padding” with inert gas to eliminate flammability
- ▶ Prepare using packaging provided by the Lab
- ▶ Label and ship with tracking number
- ▶ Contact the Lab and provide:
 - Chain of custody
 - Shipping date
 - Tracking number

Sample Results

TNMOC by EPA METHOD 25C
Fixed Gases by EPA METHOD 3C

Lab No.:	I112101-01	I112101-02	I112101-03					
Client Sample I.D.:	Can 3615	Can 3725	Can 1408					
Date/Time Sampled:	11/20/17 0:00	11/20/17 0:00	11/20/17 0:00					
Date/Time Analyzed:	11/21/17 13:17	11/21/17 14:01	11/21/17 14:46					
QC Batch No.:	171121GC8A1	171121GC8A1	171121GC8A1					
Analyst Initials:	AS	AS	AS					
Dilution Factor:	3.2	3.6	3.5					
ANALYTE (Units)	Result	RL	Result	RL	Result	RL		
TNMOC N2 corrected (ppmv-C)	2,500	32	2,500	36	2,400	35		
TNMOC uncorrected (ppmv-C)	2,000	32	2,000	36	1,900	35		
Nitrogen (% v/v)	13	3.2	14	3.6	13	3.5		
Oxygen (% v/v)	2.4	1.6	2.5	1.8	2.2	1.7		

RL = Reporting Limit

ND = Not detected at or above the RL.

TNMOC = Total Non-Methane Organic Compounds

ppmv-C = parts per million by volume as carbon

TNMOC N2 corrected (applicable if N2 < 20%)

TNMOC uncorrected = not corrected for N2 or O2

Reviewed/Approved By: Mark Johnson

Mark Johnson
Operations Manager

Date 11/27/17

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NMOC Calculation and Reporting

- ▶ Calculate average landfill C_{NMOC}
 - Use results corrected for nitrogen (N_2)
 - Convert results from ppm Carbon to ppm Hexane
 - *DIVIDE BY 6!*
 - Determine C_{NMOC} for each separate “unit”
 - Calculate landfill average weighted by:
 - Unit average C_{NMOC} (ppm) \times (*Unit area / Landfill area*)
- ▶ The sum total of all weighted unit results is your site-specific C_{NMOC}

NMOC Calculation and Reporting

- ▶ Calculate landfill NMOC emissions for reporting year using the inputs below:
 - Site-specific C_{NMOC}
 - Methane generation rate constant (k) = 0.05-year
 - Methane generation capacity (L_0) = 170 m³/Mg
 - Total waste acceptance history, and projections

Next Steps?

- ▶ Below the NMOC emission rate requiring LFGCCS?
 - Congratulations!
 - Report annual emissions using Tier 2 results
 - Retest in 5 years
- ▶ Above NMOC emission rate requiring LFGCCS?
 - All is not lost!
 - Prepare LFGCCS Design Plan
 - Additional Tier 2 testing may be performed during Plan approval
- ▶ Tier 3? Tier 4?

For More Information



NSPS Rules – Government Printing Office

<https://www.ecfr.gov/>

Test Method 25 C

https://www.epa.gov/sites/production/files/2017-08/documents/method_25c.pdf

Applicability Determination Index

<https://cfpub.epa.gov/adi/>

Contact Smith Gardner, Inc.

<http://www.smithgardnerinc.com/>

matt@smithgardnerinc.com

(919) 828-0577, ext. 121

Thank You!

